APPENDIX F

Artificial Propagation Potential as a Non-Hydro Offset for FCRPS Operations: A Summary Assessment

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NOAA Fisheries Salmon Recovery Division

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
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1.0 INTRODUCTION

The annual operation of the Federal Columbia River Hydropower System (FCRPS) adversely affects salmon and steelhead protected under the Federal Endangered Species Act (ESA). FCRPS, habitat, artificial propagation, and harvest actions have the potential to offset these affects. This report identifies artificial propagation actions that, in conjunction with functional habitat or under improving habitat conditions, could potentially provide survival benefits to listed salmon and steelhead. Here, NOAA provides analysis for eight Evolutionarily Significant Units (ESUs) of Pacific salmon and steelhead considered to be significantly affected by operation of the FCRPS in the 2000 FCRPS BiOp (NOAA Fisheries 2000). The eight ESUs covered in this report are Snake River steelhead (threatened), Upper Columbia River steelhead (endangered), Mid-Columbia River steelhead (threatened), Snake River spring/summer chinook (threatened), Upper Columbia River spring chinook (endangered), Snake River fall chinook (threatened), Snake River sockeye (endangered), and Columbia River chum.

2.0 BACKGROUND

Under Section 7(a)(2) of the Endangered Species Act (ESA), Federal agencies "shall insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered species or threatened species." Hydro actions are the first choice or preferred method for offsetting FCRPS affects and avoiding jeopardy, according to the U.S. Army Corps of Engineers, Bureau of Reclamation, and Bonneville Power Administration (Action Agencies). Other actions in addition to improved hydro operations in the form of complementary habitat, hatchery, and harvest actions, may be necessary and appropriate to avoid jeopardizing salmon and steelhead ESUs protected under the ESA. In the event that non-hydro offset is warranted because of hydrosystem mortality, a key step is determining the potential for different actions to benefit protected salmon and steelhead.

Non-hydro offsets provided by the Action Agencies will not preclude the need for improvements in habitat, hatcheries, and harvest by other Federal or non-Federal parties, nor will it diminish the obligation of these other parties to seek improvements in furtherance of Section 7(a)(1) or Section 7(a)(2). Hatchery actions are intended to complement, not displace, actions by other entities to address habitat, hatcheries, and harvest. Where there are overlaps between hatchery offset activities of the Action Agencies and the responsibilities of other Federal and non-Federal entities, costs and implementation responsibilities should be coordinated, as appropriate. The Action Agencies should understand that their actions under Section 7(a)(2) alone will not be sufficient to recover protected salmon and steelhead and satisfy their obligations under Section 7(a)(1).

3.0 DEFINITIONS

Growth rate and productivity - The terms "population growth rate" and "population productivity" are interchangeable when referring to measures of population production over a Pacific salmon's entire life cycle. Natural population replacement rate, replacement rate in the absence of hatchery-origin fish, per capita productivity at low population sizes, and trends in

salmonid traits (e.g., fecundity of spawners) that affect population productivity are key to determining growth rate/productivity.

Hatchery - Facilities, equipment and operations at a specific location that support one or more artificial propagation programs.

Hatchery-origin - Fish from parents that were selected and spawned artificially.

Independent population – Populations that are reproductively isolated from other conspecific units and that have population dynamics that are substantially independent of other units.

Integrated propagation programs - Artificial propagation programs designed and operated to protect and promote population viability. Only natural-origin and hatchery-origin fish derived from the same population are used for broodstock. Use of other broodstock sources (e.g., to meet a production goal for numbers of fish produced by the program) is inappropriate. In some years, low run size may preclude reaching desired levels of natural-origin fish in the broodstock (a minimum of ten to twenty percent natural-origin fish in the broodstock is desirable). Captive broodstock programs and the reintroduction of fish into vacant habitats for conservation purposes are considered integrated propagation programs.

Isolated propagation programs - Artificial propagation programs that do not follow practices designed to protect or promote population viability. Fish in isolated programs are more likely to diverge genetically from natural populations included in an ESU, and to therefore be excluded from the ESU.

Natural-origin - Fish from naturally-spawning parents.

Pacific salmon - Any of the six species of the genus *Oncorhynchus* including *O. gorbuscha* (pink salmon), *O. keta* (chum salmon), *O. kisutch* (coho salmon), *O. nerka* (sockeye salmon), *O. tshawytscha* (chinook salmon), and the anadromous form of *O. mykiss* (steelhead).

Population - Populations are defined based on biological processes (i.e., reproductive isolation and demographic independence) and not based on geography or jurisdictional boundaries. A population (or independent population) must be sufficiently reproductively isolated from other conspecific units so that its population dynamics or risk of extinction are substantially independent.

Propagation program – An individual operation at a hatchery facility that produces a particular species or life-stage. A single hatchery facility can support one or multiple propagation programs.

Viable salmonid populations (VSP) - A concept that identifies attributes (abundance, population growth rate, diversity, and spatial distribution) and provides guidance for determining the biological status of populations and larger-scale groupings of Pacific salmonids.

4.0 ARTIFICIAL PROPAGATION IMPROVEMENT POTENTIAL BY ESU

Following are tables that summarize the potential for artificial propagation to reduce the risk factors for each of eight ESUs in this report. These tables inform Table 6.11.

The information in the following tables is summarized from:

NOAA Fisheries 2004. Salmonid hatchery inventory and effects evaluation report: An evaluation of the effects of artificial propagation on the status and likelihood of extinction of west coast salmon and steelhead under the Federal Endangered Species Act. NOAA Fisheries, Northwest Region, Salmon Recovery Division. May 28, 2004. Available on the internet at: www.nwr.noaa.gov/1srd/Prop_Determins/

Table F.1: Snake River Fall Chinook Salmon ESU, Status Threatened.

Population	Priority to the ESU	Status	Risk Factors	Potential for Artificial Propagation to Alleviate Risk Factors*
1. Snake River Fall Chinook	High	Medium Risk	Diversity Productivity Abundance Distribution	Shift production from existing programs to expand fall chinook distribution in Clearwater and Grande Ronde watersheds, and, at the same time, reserve one mainstem spawning area for natural production only. This will help with assessing natural productivity. Broodstock collection should target 20- to 30-percent natural-origin fish, which will require improved adult collection capabilities.* Improve prevention of out-of-basin hatchery strays (primarily from the BPA-funded Umatilla Program) from escaping above Lower Granite Dam. Actions would primarily address diversity and distribution risk factors. They would also be expected to increase the number of naturally spawning fish in certain areas and facilitate monitoring the status and composition of the population. Three programs are associated with Snake River fall chinook salmon. The USFWS LSRCP Lyons Ferry Hatchery (funded by BPA), Nez Perce Tribal Hatchery (funded by BPA), and Idaho Power Company mitigation programs.

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Table F.2: Snake River Steelhead ESU, Status Threatened.
General Recommendation: Initiate a steelhead kelt reconditioning program. Spawned-out steelhead adults (kelts) could be collected at Lower Granite Dam and/or targeted tributaries. Will require development of new facilities and appropriate water sources.

Population	Priority to the ESU	Status	Risk Factors	Potential for Artificial Propagation to Alleviate Risk Factors *
1. Tucannon River	Medium	Medium	Abundance Diversity Productivity	Initiate actions to improve the segregation of hatchery stock from the natural-origin population and/or transition entire program to a locally-derived stock. Actions will primarily reduce the diversity risk factor and increase the number of naturally-spawning fish. Actions may also help productivity if non-local hatchery stocks are depressing reproductive success of the natural population. Hatchery program is a USFWS LSRCP program funded by BPA.
2. Asotin Creek	Low	Unknown	Abundance Productivity	None.
3. Clearwater River lower mainstem	Low	Medium Risk	Abundance Diversity Productivity	Initiate new program on Nez Perce Tribal Reservation.* Consider initiating a steelhead reproduction study, possibly paired with one of the B-run supplementation programs. This action would increase the number of naturally-spawning fish.
4. South Fork Clearwater River	Medium	High Risk	Abundance Diversity Productivity	Initiate improvements to existing program to improve ability to incorporate natural B-run adults into the hatchery supplementation broodstock.* Action would increase the number of naturally-spawning fish and reduce the diversity risk factor. Two hatchery steelhead programs operate in the Clearwater Basin. One is operated by USFWS and funded by the Corps (Dworshak Dam mitigation). The other is a USFWS LSRCP program (Clearwater Anadromous) with funding from BPA.
5. Lolo Creek	Low	High Risk	Abundance Diversity Productivity	Improve existing program by developing a local B-run steelhead hatchery stock, or begin incorporating natural fish into existing broodstock from Clear Creek and Lolo Creek.* Action would increase the number of naturally-spawning fish and reduce the Diversity risk factor. See South Fork Clearwater discussion for summary of existing hatchery program.

Table F2: Snake River Steelhead ESU, Status Threatened.

Population	Priority to the ESU	Status	Risk Factors	Potential for Artificial Propagation to Alleviate Risk Factors *
6. Selway River	High	Unknown	Abundance Productivity	None. Reserved for natural production only.
7. Lochsa River	High	Unknown	Abundance Productivity	None. Reserved for natural production only.
8. Grande Ronde River lower mainstem tributaries	Medium	Unknown	Abundance Productivity Diversity	Improve current hatchery practices by better isolating hatchery and natural fish. Action would primarily address the diversity risk factor. Current program appears to be fairly isolated, so potential to reduce risk may be minor. The current hatchery program is located at Cottonwood Acclimation Pond and is a USFWS LSRCP program funded by BPA.
9. Joseph Creek	High	Low Risk	Abundance Productivity	None. Reserved for natural production only.
10. Wallowa River	Medium	Low-Medium Risk	Abundance Diversity Productivity	Develop local hatchery stock for supplementation study on one of the tributaries.* Action would primarily be a study to assess reproductive success of locally-derived hatchery stock. Existing hatchery program appears to be isolated from natural populations. Current hatchery program is a USFWS LSRCP program funded by BPA.
11. Grande Ronde River upper mainstem tributaries	Medium	High Risk	Abundance Productivity	None.
12. Little Salmon and Rapid River	Low	Medium Risk	Abundance Productivity	None. Little Salmon River managed for terminal fishing. Increased monitoring and evaluation would be useful to better confirm that the hatchery program is segregated from nearby natural populations. Rapid River upstream of the hatchery is reserved for natural production. Two hatchery programs release fish. One is an Idaho Power Company mitigation program for construction of Hells Canyon Dam complex. The other is a USFWS LSRCP program funded by BPA.
13. South Fork Salmon River	High	Unknown	Abundance Productivity	None. Reserved for natural production only.

Table F2: Snake River Steelhead ESU, Status Threatened.

Population	Priority to the ESU	Status	Risk Factors	Potential for Artificial Propagation to Alleviate Risk Factors *
14. Secesh River	High	Unknown	Abundance Productivity	None. Reserved for natural production only.
15. Chamberlain Creek	Medium	Unknown	Abundance Productivity	None. Reserved for natural production only.
16. Middle Fork Salmon River lower mainstem	High	Unknown	Abundance Productivity	None. Reserved for natural production only.
17. Middle Fork Salmon River upper mainstem	High	Unknown	Abundance Productivity	None. Reserved for natural production only.
18. Panther Creek	Medium	Unknown	Abundance Productivity	None.
19. North Fork Salmon River	Low	Unknown	Abundance Productivity Diversity	Initiate new locally-derived steelhead program. Action could be a new program or devised as an improvement to the existing upper Salmon River basin steelhead programs. Action would primarily increase the number of naturally-spawning fish.
20. Lemhi River	Medium	High Risk	Abundance Diversity Productivity	Improve existing program by developing a locally-derived Lemhi River stock to replace the current hatchery stock. Develop facilities needed to implement. Action would increase the number of naturally-spawning fish and reduce the diversity risk factor. Two programs operate in the upper Salmon River basin. One is an Idaho Power Company mitigation program for construction of Hells Canyon Dam complex. The other is a USFWS LSRCP program funded by BPA.
21. Pahsimeroi River	Low	High Risk	Abundance Productivity Diversity	Reform current program to transition to a hatchery stock that is part of the ESU. Action would increase the number of naturally-spawning fish and reduce the diversity risk factor.* Pahsimeroi Hatchery is an Idaho Power Company mitigation program for construction of Hells Canyon Dam complex.

Table F2: Snake River Steelhead ESU, Status Threatened.

Population	Priority to the ESU	Status	Risk Factors	Potential for Artificial Propagation to Alleviate Risk Factors *
22. East Fork Salmon River	Low	High Risk	Abundance Diversity Productivity	Implement actions to improve and expand the use of local broodstock. Implement reforms to existing non-ESU hatchery program to improve isolation from natural-origin fish.* Actions would increase the number of naturally-spawning fish and reduce the diversity risk factor. Program is a USFWS LSRCP program funded by BPA.
23. Salmon River upper mainstem	Low	High Risk	Abundance Diversity Productivity	Reform current program to transition to a hatchery stock that is part of the ESU. Action would increase the number of naturally-spawning fish and reduce the diversity risk factor.* This is a USFWS LSRCP program funded by BPA.
24. Imnaha River	Medium	Medium Risk	Abundance Diversity Productivity	Initiate a monitoring and evaluation program for Big Sheep Creek. Assess options for incorporating Big Sheep natural-origin adults into supplementation broodstock. This action would primarily address the diversity risk factor. This is a USFWS LSRCP program funded by BPA.
25. Snake River Hells Canyon tributaries	Low	Unknown	Abundance Diversity Productivity	Improve the isolation of hatchery stock from the natural population. Action would primarily address the diversity risk factor. This is an Idaho Power Company mitigation program.

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Table F.3: Snake River Sockeye Salmon ESU, Status Endangered**.**

Population	Priority to the ESU	Status	Risk Factors	Potential for Artificial Propagation to Alleviate Risk Factors*
1. Redfish Lake Sockeye Salmon	High	High Risk	Diversity Productivity Abundance Distribution	High risk associated with all four VSP parameters. Modify or develop new facilities to produce approximately 200,000 yearling smolts for release into Stanley Basin Lakes. Multiple rearing sites should be considered to reduce risk of loss of entire year-class due to mechanical or other problems in the hatchery.* The current program is funded by BPA. Any new programs should be informed by research conducted by the Stanley Basin Sockeye Technical Oversight Committee. Artificial propagation actions may only work to reduce risk if taken together with actions to improve habitat productivity.

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Table F.4: Snake River Spring/Summer Chinook Salmon ESU, Status Threatened**.**

Population	Priority to the ESU	Status of Population	Primary Risk Factors	Potential for Artificial Propagation to Alleviate Risk Factors*
1. Tucannon River	Medium	Medium Risk	Abundance Productivity Diversity	Seed habitat with larger numbers of fish to increase the number of natural spawners.* Develop lower river trap to improve broodstock collection, reduce straying, and improve population monitoring. These actions would primarily address the diversity risk factor. The current hatchery program is a USFWS LSRCP program funded by BPA. A second program (captive broodstock) is funded by BPA.
2. Asotin Creek	Low	May be extirpated	Abundance Diversity Productivity Distribution	There are no spring chinook artificial propagation programs in this subbasin. Jump-start recovery by seeding the area with juvenile fish. Risk factors addressed would include abundance and distribution. Diversity may also be enhanced as fish adapt to local environmental conditions.
3. Wenaha River	Medium	High Risk	Abundance Productivity	None. Reserved for natural production only.
4. Lostine River	Medium	Medium Risk	Abundance Productivity	Improvements to current artificial propagation program.* Action is expected to increase the number of naturally-spawning fish. Current program is a USFWS LSRCP program funded by BPA. Improvements are in planning stage via Northeast Oregon Hatchery master planning with funding from BPA.
5. Minam River	Medium	High Risk	Abundance Productivity	None. Reserved for natural production only.
6. Catherine Creek	Medium	High Risk	Abundance Productivity	Improvements to current artificial propagation program.* Action would increase the number of naturally-spawning fish due to higher survival. Diversity may be increased over time if improvements allow successful reintroduction into Lookingglass Creek. Current program is a USFWS LSRCP program funded by BPA. Improvements are in planning stage via Northeast Oregon Hatchery master planning with funding from BPA.

Table F.4: Snake River Spring/Summer Chinook Salmon ESU, Status Threatened**.**

Population	Priority to the ESU	Status of Population	Primary Risk Factors	Potential for Artificial Propagation to Alleviate Risk Factors*
7. Grande Ronde upper mainstem	Medium	High Risk	Abundance Productivity	Improvements described for Lostine and Catherine Creek would also benefit this population.
8. Imnaha River	Medium	Low Risk	Productivity	Implement improvements to current program to improve adult monitoring and enumeration capability. Current program is a USFWS LSRCP program funded by BPA.
9. Big Sheep Creek	Low	High Risk	Abundance Productivity Distribution Diversity	Big Sheep Creek chinook may have been extirpated during the 1990s. Imnaha River adults are released into Big Sheep as part of a reintroduction program. The existing program could be expanded to include a juvenile-based program. Action would help address abundance, distribution, and diversity. Current program is a USFWS LSRCP program funded by BPA.
10 Little Salmon River	Low	Medium Risk	Abundance Diversity Productivity	None. The Little Salmon River is managed to provide terminal fishing opportunity. Rapid River above the hatchery is managed for natural production, but the population appears to be genetically similar to the out-of-ESU hatchery stock.
11. South Fork Salmon River mainstem	High	Medium Risk	Abundance Productivity	Implement improvements to current program to improve adult monitoring and enumeration capability. Current program is a USFWS LSRCP program funded by BPA.
12. Secesh River	High	Medium Risk	Abundance Productivity	None. Reserved for natural production only. This is the only South Fork Salmon River population with no hatchery influence.
13. East Fork South Fork Salmon River	Medium	Medium Risk	Abundance Productivity	None at this time. Current program on Johnson Creek will be monitored for 5 years before any decision to continue, terminate, or expand the program. Current program is operated by Nez Perce Tribe with funding from BPA.

Table F.4: Snake River Spring/Summer Chinook Salmon ESU, Status Threatened**.**

Population	Priority to the ESU	Status of Population	Primary Risk Factors	Potential for Artificial Propagation to Alleviate Risk Factors*
14. Chamberlain Creek	Medium	Medium Risk	Abundance Productivity	None. Reserved for natural production only.
15. Big Creek 16. Middle Fork Indian Creek 17. Camas Creek 18. Loon Creek 19. Pistol Creek 20. Sulphur Creek 21. Bear Valley Creek 22. Marsh Creek 23. Middle Fork Indian Cr	High	Medium Risk	Abundance Productivity	None. Reserved for natural production only. This group represents the largest collection of chinook populations in the Columbia Basin free from any significant hatchery influence. Primarily located within wilderness area.
24. North Fork Salmon River	Low	High Risk	Abundance Productivity	None.
25. Lemhi River	Medium	Medium Risk	Abundance Productivity	None. Control stream for Idaho Supplementation Studies (ISS). Study ends in 2012.
26. Pahsimeroi River	Low	Low Risk	Abundance Productivity	None. Existing hatchery program buffers near-term risks. Current hatchery program is operated by IDFG with funding from Idaho Power Company.
27. Salmon River below Redfish Lake Creek	Medium	High Risk	Abundance Productivity	None.
28. East Fork Salmon River	Medium	High Risk	Abundance Productivity	None. Stream is part of ISS. Abundance is very low. Previous hatchery program may have accelerated population decline. Factors that contributed to this poor performance would need to be determined before any new investments in artificial propagation.
29. Yankee Fork	Low	High Risk	Abundance Productivity Distribution Diversity	Initiate new artificial propagation program for mainstem Yankee Fork.* Action would increase the number and distribution of natural spawners.

Table F.4: Snake River Spring/Summer Chinook Salmon ESU, Status Threatened**.**

Population	Priority to the ESU	Status of Population	Primary Risk Factors	Potential for Artificial Propagation to Alleviate Risk Factors*
30. Valley Creek	Medium	High Risk	Abundance Productivity Distribution	Valley Creek is an ISS control stream. Assess ability to initiate new program on Elk Creek (Valley Creek tributary) consistent with ISS. Action would increase the number and distribution of natural spawners.
31. Salmon River upstream of Redfish Lake Creek	High	Medium Risk	Abundance Productivity	None. Existing hatchery program (Sawtooth) is managed by USFWS as part of the LSRCP, operated by IDFG, and funded by BPA.

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Table F.5: Upper Columbia Spring Chinook Salmon ESU, Status Endangered

Population	Priority to the ESU	Status	Risk Factors	Potential for Artificial Propagation to Alleviate Risk Factors*
1. Wenatchee River	High	High Risk	Abundance Productivity Diversity Distribution	Two hatchery programs operate in the basin. One (Leavenworth NFH) is operated by USFWS and funded by USBR to mitigate for upper Columbia Federal dams. The Chiwawa River program is a Chelan PUD obligation. There is limited potential to reduce risks to diversity from a transition to local Wenatchee stock from the Carson stock used at Leavenworth NFH.
2. Entiat River	High	High Risk	Abundance Productivity Diversity	Terminate release in the Entiat River of Carson stock spring chinook. Options to consider include: 1. Transition to local Entiat spring chinook or the most suitable stock for recolonization in the event that Entiat fish are unavailable. Develop broodstock collection and acclimation facilities and evaluations as needed to implement program. 2. Release Carson stock out of the basin to maintain program objectives to support tribal and non-tribal harvest. May need acclimation facility to improve homing of adult returns. 3. Transition program to rear different species. Initiate evaluations as needed to monitor effects on listed populations. All risk factors are reduced by ceasing out-of-ESU Carson stock influence. Only limited potential to jump-start recovery (using fish best suited to the Entiat River) without concurrent actions to improve habitat productivity. Existing hatchery program is operated by USFWS and funded by USBR as an offset for upper Columbia River Federal dams.

Table F.5: Upper Columbia Spring Chinook Salmon ESU, Status Endangered

Population	Priority to the ESU	Status	Risk Factors	Potential for Artificial Propagation to Alleviate Risk Factors*
3. Methow River	High	High Risk	Abundance Productivity Diversity Distribution	Two hatchery programs operate within the basin. One is a PUD-funded obligation (Methow Hatchery), and the second (Winthrop Hatchery) is operated by USFWS and funded by the USBR as an offset for upper Columbia River Federal dams. Hatchery improvements accomplished together with habitat improvements could contribute to reducing risk factors. The combination of new rearing ponds and acclimation sites would allow programs to better manage Bacterial Kidney Disease problems and still achieve their goals. It would also allow the programs to more effectively seed the basin and jump-start chinook salmon recovery. Risks to chinook salmon diversity would be reduced by improving broodstock collection facilities (i.e., collect natural-origin fish for broodstock and eliminate the use of Carson derivatives). Hatchery programs alone are not mitigating for low habitat productivity, which is the greatest risk factor facing this population.

*NOAA Fisheries supporting action in *US v. Oregon*

Table F.6: Upper Columbia Steelhead ESU, Status Threatened

Population	Priority to the ESU	Status	Risk Factors	Potential for Artificial Propagation to Alleviate Risk Factors *
1. Wenatchee River	High	High Risk	Abundance Productivity Diversity Distribution	Potential improvements to the existing program (in addition to Chelan PUD obligations under the HCPs) include new or improved juvenile acclimation and release facilities. Actions would primarily help address distribution of the populations.
2. Entiat River	High	High Risk	Abundance Productivity Diversity	None. Managed for natural production.
3. Methow River	High	High Risk	Abundance Productivity Diversity Distribution	Douglas PUD is obligated under an HCP to fund existing steelhead production (except for Winthrop NFH production). Potential improvements to these programs include transitioning from Wells stock to a local Methow River stock, developing adult collection and acclimation facilities as needed. Improve adult holding conditions to improve survival and allow segregation of multiple stocks and/or parental crosses. Actions would primarily help promote diversity and abundance. Productivity of the hatchery program may also be improved by using fish specifically adapted to the Methow River.
4. Okanogan River	Medium	High Risk	Abundance Productivity Diversity	Develop a kelt reconditioning program. Transition hatchery program to an Okanogan River stock. Develop facilities and evaluations as needed to accomplish goal. Actions would help address diversity and abundance risk factors.

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Table F.7: Middle Columbia Steelhead ESU, Status Threatened.

Population	Priority to the ESU	Status	Risk Factors	Potential for Artificial Propagation to Alleviate Risk Factors*
1. Touchet River	Low	High Risk	Abundance Diversity Productivity	Initiate actions to improve isolation of hatchery and natural-origin fish and/or transition program entirely to a local Touchet River stock. Actions will increase the number of naturally-spawning fish and reduce the diversity risk factor. Program is a USFWS LSRCP program funded by BPA.
2. Walla Walla River	Medium	Low Risk	Abundance Productivity Diversity	None for upper basin. Reserved for natural production only. In the lower basin, initiate actions to improve isolation of hatchery fish from natural-origin fish. Assess need to transition program to a locally-derived stock. Enhance monitoring and evaluation to assess hatchery straying. Action would primarily address the diversity risk factor. Program is a USFWS LSRCP program funded by BPA.
3. Umatilla River	Medium	Low Risk	Abundance Productivity	Initiate actions to improve current program. Action would increase the number of naturally-spawning fish. Program is funded by BPA.
4. John Day River lower mainstem tributaries	High	Medium Risk	Abundance Diversity Productivity	None. Reserved for natural production only.
5. John Day River upper mainstem	Medium	Medium Risk	Abundance Productivity	None. Reserved for natural production only.
6. North Fork John Day River	High	Low Risk	Abundance Productivity	None. Reserved for natural production only.
7. South Fork John Day River	Low	Medium Risk	Abundance Productivity	None. Reserved for natural production only.

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Table 7: Middle Columbia Steelhead ESU, Status Threatened.

Population	Priority to the ESU	Status	Risk Factors	Potential for Artificial Propagation to Alleviate Risk Factors*
8. Middle Fork John Day River	High	Medium Risk	Abundance Productivity	None. Reserved for natural production only.
9. Deschutes River eastside	High	Medium Risk	Abundance Diversity Productivity	Assess options for trapping and removal of out-of-basin hatchery strays. Assess ability to begin incorporating natural-origin fish included in the ESU into the Deschutes hatchery stock. Actions will primarily address the diversity risk factor.
10. Deschutes River westside	High	Medium Risk	Abundance Diversity Productivity	See above.
11. Fifteenmile Creek	Medium	Medium Risk	Abundance Productivity	None. Reserved for natural production only.
12. White Salmon River	Low	High Risk	Abundance Diversity Productivity Distribution	Develop local stock for reintroduction into the upper watershed once Condit Dam is removed.
13. Klickitat River	High	Unknown	Abundance Diversity Productivity	Transition from non-ESU hatchery stock to locally-derived stock. This action will primarily help address the diversity risk factor, and it will also increase the number of naturally-spawning fish. Will require renovating or providing new adult collection and trapping facility at Lyle Falls.
14. Rock Creek	Low	Unknown	Abundance Productivity	None.
15. Toppenish and Satus creeks	High	Medium Risk	Abundance Productivity	None. Continue kelt reconditioning.
16. Naches River	High	High Risk	Abundance Productivity	None. Continue kelt reconditioning.
17. Yakima River upper mainstem	High	High Risk	Abundance Productivity Distribution	Develop kelt reconditioning facility in upper watershed. Primarily addresses abundance risk factor.

* NOAA Fisheries supporting action in *US v. Oregon*

Table F.8. Columbia River Chum Salmon ESU, Status Threatened

Population	Priority to the ESU[1]	Status	Risk Factors	Potential for Artificial Propagation to Alleviate Risk Factors
1. Grays/Chinook River	High	High Risk	Abundance Productivity Diversity Distribution	There are two programs, one operated by Sea Resources in the Chinook River and one operated by WDFW in the Grays River. Reduction in risk factors would be tied to habitat improvements in the basins and continuation of the artificial propagation programs. There is very low probability that additional program measures will further reduce risks.
2. Elochoman/ Skamokawa River	High	High Risk	Abundance Productivity Diversity Distribution	There are no artificial propagation programs operated in these basins for chum salmon. The potential for artificial propagation to reduce risks to this population is low due to poor habitat and low abundance.
3. Mill/Germany/ Abernathy Creeks	Medium	High Risk	Abundance Productivity Diversity Distribution	There are no artificial propagation programs operated in these basins for chum salmon. The potential for artificial propagation to reduce risks to this population is low due to poor habitat and low abundance.
4. Youngs Bay	High	High Risk	Abundance Productivity Diversity Distribution	There are no artificial propagation programs operated in this basin for chum salmon. The potential for artificial propagation to reduce risks to this population is low due to poor habitat and low abundance.
5. Big Creek	High	High Risk	Abundance Productivity Diversity Distribution	There are no artificial propagation programs operated in this basin for chum salmon. The potential for artificial propagation to reduce risks to this population is low due to poor habitat and low abundance.
6. Clatskanie River	Medium	High Risk	Abundance Productivity Diversity Distribution	There are no artificial propagation programs operated in this basin for chum salmon. However, there is good habitat available in the basin, so development of artificial propagation programs has the potential to reduce risks. A program in this basin would increase distribution by supporting a population in Oregon.

Table F.8. Columbia River Chum Salmon ESU, Status Threatened

Population	Priority to the ESU[1]	Status	Risk Factors	Potential for Artificial Propagation to Alleviate Risk Factors
7. Scappoose River	Medium	High Risk	Abundance Productivity Diversity Distribution	There are no artificial propagation programs operated in this basin for chum salmon. However, there is good habitat available in the basin, so development of artificial propagation programs has the potential to reduce risks. A program in this basin would increase distribution by supporting a population in Oregon.
8. Lower Cowlitz River	High	High Risk	Abundance Productivity Diversity Distribution	There are no artificial propagation programs operated in this basin for chum salmon. The potential for artificial propagation to reduce risks to this population is low due to poor habitat and low abundance.
9. Lewis River	High	High Risk	Abundance Productivity Diversity Distribution	There are no artificial propagation programs currently operated in this basin for chum salmon. There is the potential for artificial propagation in the form of remote-site incubators to support ongoing chum habitat improvement projects in the basin.
10. Kalama River	Medium	High Risk	Abundance Productivity Diversity Distribution	There are no artificial propagation programs operated in this basin for chum salmon. The potential for artificial propagation to reduce risks to this population is low due to poor habitat and low abundance.
11. Salmon Creek	Medium	High Risk	Abundance Productivity Diversity Distribution	There are no artificial propagation programs operated in this basin for chum salmon. The potential for artificial propagation to reduce risks to this population is low due to poor habitat and low abundance.
12. Washougal River	High	High Risk	Abundance Productivity Diversity Distribution	There are no artificial propagation programs currently releasing chum salmon in the basin. There is the potential for artificial propagation in the form of remote-site incubators to support ongoing habitat improvement projects in the basin.
13. Clackamas River	High	High Risk	Abundance Productivity Diversity Distribution	There are no artificial propagation programs operated in this basin for chum salmon. The potential for artificial propagation to reduce risks to this population is low due to poor habitat and low abundance.

Table F.8. Columbia River Chum Salmon ESU, Status Threatened

Population	Priority to the ESU[1]	Status	Risk Factors	Potential for Artificial Propagation to Alleviate Risk Factors
14. Sandy River	Medium	High Risk	Abundance Productivity Diversity Distribution	There are no artificial propagation programs operated in this basin for chum salmon. The potential for artificial propagation to reduce risks to this population is low due to poor habitat and low abundance.
15. Lower Gorge Tributaries	High	High Risk	Abundance Productivity Diversity Distribution	There is one program operated by WDFW to reestablish chum salmon into Duncan Creek. The program reduces risk to abundance by acting as safety net for populations in the Ives Island area during years of very low flows below Bonneville Dam. There is very low probability that additional program measures will further reduce risks.
16. Upper Gorge Tributaries	Medium	High Risk	Abundance Productivity Diversity Distribution	There are no artificial propagation programs operated in these basins for chum salmon. The potential for artificial propagation to reduce risks to this population is low due to poor habitat and low abundance.

1. Populations rated as High were identified as core populations by the Willamette/Lower Columbia Technical Review Team.